"FEE ADDRESS" INDICATION FORM

To: MAIL STOP: M Fee Correspondence

U.S. Patent & Trademark Office

P.O. Box 1450

Alexandria, VA 22313-1450

Please recognize as the "Fee Address," under the provisions of 37 CFR 1.363, the following address:

COMPUTER PATENT ANNUITIES, INC. 225 Reinekers Lane Suite 400 Alexandria, VA 22314

Payor Number: 000197

in the following listed application(s) or patent(s) for which the issue fee has been paid.

<u>Patent No.</u> <u>Serial No.</u> <u>Patent Date</u> <u>US 371 Filing Date</u> <u>Confirmation No.</u> <u>Attorney Docket</u> <u>No.</u>

7,569,988 B2 10/579,691

8/4/09

5/18/06

9637

0553-0500

Respectfully Submitted,

Mark J. Murphy

Registration No. 34,225 Date: August 31, 2009

COOK ALEX Ltd. 200 West Adams Street Suite 2850 Chicago, Illinois 60606 (312) 236-8500

Customer No: 26568



(12) United States Patent Ikeda et al.

(10) Patent No.:

US 7,569,988 B2

(45) Date of Patent:

Aug. 4, 2009

LIGHT EMITTING ELEMENT AND DISPLAY (54)DEVICE USING THE SAME

Inventors: Hisao Ikeda, Kanagawa (JP); Junichiro

Sakata, Kanagawa (JP); Daisuke Kumaki, Nigata (JP); Satoshi Seo,

Kanagawa (JP)

Assignee: Semiconductor Energy Laboratory

Co., Ltd. (JP)

Subject to any disclaimer, the term of this patent is extended or adjusted under 35

U.S.C. 154(b) by 165 days.

(21) Appl. No.:

10/579,691

PCT Filed:

Notice:

(*)

Sep. 26, 2005

(86) PCT No.:

PCT/JP2005/018215

§ 371 (c)(1),

(2), (4) Date:

May 18, 2006

(87) PCT Pub. No.: WO2006/035952

PCT Pub. Date: Apr. 6, 2006

(65)**Prior Publication Data**

> US 2007/0159082 A1 Jul. 12, 2007

(30)Foreign Application Priority Data

Sep. 30, 2004 2004-288408

(51) Int. Cl.

H01.J 1/62

(2006.01)

U.S. Cl. **313/506**; 313/504; 313/512 (52)

313/504, 506, 512

See application file for complete search history.

(56)References Cited

U.S. PATENT DOCUMENTS

6,013,384 A

1/2000 Kido et al. 428/690

(Continued)

FOREIGN PATENT DOCUMENTS

EP

0 855 848 A2 7/1998

(Continued)

OTHER PUBLICATIONS

IMES, Yamagata Univ., "Multi Photon Emission Organic EL Devices Using Charge-Transfer Complex as Charge Generation Layer." Extended Abstract, 27a-ZL-12, The 63rd Applied Physics-Related Combined Seminar, Seminar Proceedings (Niigata Univ.) p. 1165, Autumn Meeting, Sep. 24, 2002, with English translation.

(Continued)

Primary Examiner-Vip Patel

(74) Attorney, Agent, or Firm-Cook Alex Ltd.

ABSTRACT

An object of the invention is to provide a highly reliable light emitting element with low drive voltage and longer life than a conventional light emitting element, and a display device using the light emitting element. A light emitting element according to the invention comprises a plurality of layers which is interposed between a pair of electrodes, in which at least one of the plurality of layers is formed of a layer containing a light emitting material, and the layer containing a light emitting material is interposed between a layer containing an oxide semiconductor and/or metal oxide and a material having a higher hole transporting property than an electron transporting property, and a layer containing an oxide semiconductor and/or metal oxide, a material having a higher electron transporting property than a hole transporting property and a material which can donate electrons to the material having a higher electron transporting property than a hole transporting property.

28 Claims, 13 Drawing Sheets

